



PERSEREC

Technical Report 15-04
October 2015

Indicators of Suicide Found on Social Networks: Phase 2

Andrée E. Rose
*Defense Personnel and Security Research Center
Defense Manpower Data Center*

Christina M. Hesse
Northrop Grumman Technical Services

Indicators of Suicide Found on Social Networks: Phase 2

Andrée E. Rose—*Defense Personnel and Security Research Center/DMDC*

Christina M. Hesse—*Northrop Grumman Technical Services*

Released by – Eric L. Lang

BACKGROUND

This is a follow-on study that re-examines publicly available social networking posts associated with (1) military Service personnel who died by suicide, and (2) a demographically matched control group. In the initial effort, the objective was to determine if military Service personnel, who died by suicide, provided signals of their trajectory towards suicide on their social networking profiles. In particular, the first study was looking for signals that correspond with indicators from the fluid vulnerability theory.

Social media data were coded for 36 clinical indicators of suicide and analyzed to determine the strength of relationship between cause of death and each of these indicators.

In this study, a qualitative content analysis was conducted to identify recurring themes that were not coded for during the first study. This effort sought to identify positive and negative information posted online, and evaluate interactions between study subjects and third parties.

HIGHLIGHTS

This analysis showed that military Service personnel with social networking profiles posted evidence of both risk and protective factors. Subjects in the non-suicide group were more likely to post information reflecting (1) a sense of meaning or purpose, (2) positive online interactions, (3) real world connections, and (4) optimistic outlook on life.

Subjects in the suicide group were more likely to post information about (1) negative employment experiences, (2) personal access to, or ownership of, firearms, (3) emotional distress, (4) self-help, and (5) implied suicide (i.e., vague statements indicating an imminent departure).

Interactions with third parties (i.e., online friends), were generally positive and helpful in both groups. However, only subjects in the suicide group had friends who expressed an urgency to connect with subjects in the physical environment.

Recommendations for integrating these findings into suicide prevention efforts are offered, as well as recommendations for additional social media research.

REPORT DOCUMENTATION PAGE

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188		
<p>The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.</p>					
1. REPORT DATE: 08-Oct-2015		2. REPORT TYPE Technical Report 15-04		3. DATES COVERED: Oct-2014/oct-2015	
4. Indicators of Suicide Found on Social Networks: Phase 2		5a. CONTRACT NUMBER:			
		5b. GRANT NUMBER:			
		5c. PROGRAM ELEMENT NUMBER:			
6. AUTHOR(S): Andrée E. Rose, Christina M. Hesse		5d. PROJECT NUMBER:			
		5e. TASK NUMBER:			
		5f. WORK UNIT NUMBER:			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Defense Personnel and Security Research Center Defense Manpower Data Center 400 Gigling Road Seaside, CA 93955		8. PERFORMING ORGANIZATION REPORT NUMBER PERSEREC: Technical Report 15-04			
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSORING/MONITOR'S ACRONYM(S)			
		11. SPONSORING/MONITOR'S REPORT NUMBER(S):			
12. DISTRIBUTION/AVAILABILITY STATEMENT: (A) Distribution Unlimited					
13. SUPPLEMENTARY NOTES:					
<p>ABSTRACT: This is a follow-on study to the technical report <i>Indicators of Suicide Found on Social Networks: Phase 1</i>. The original study was a retrospective effort that examined social media posts made by military Service personnel within the year prior to their deaths. Four hundred and twenty-eight subjects were found to have social media profiles, and of those, only 315 subjects had publicly available information available of assessment. Researchers at the National Center for Veterans Studies (NCVS) coded the data for 36 clinical indicators of suicide. For this effort, emerging themes that were not coded by NCVS were identified. Findings indicate that social media data provide insight on subjects' thoughts and behaviors within the year preceding death.</p>					
14. SUBJECT TERMS:					
15. SECURITY CLASSIFICATION OF: Unclassified			16. LIMITATION OF ABSTRACT:	17. NUMBER OF PAGES: 42	19a. NAME OF RESPONSIBLE PERSON: Eric L. Lang, Director
a. REPORT: Unclassified	b. ABSTRACT: Unclassified	c. THIS PAGE: Unclassified			19b. TELEPHONE NUMBER (Include area code): 831-583-2846
Standard Form 298 (Rev. 8/98) Prescribed by ANSI td. Z39.18					

PREFACE

The suicide rate among military Service personnel has traditionally been lower than the civilian rate of suicide. Since 2001, the military's suicide rate has steadily increased and is now comparable to the civilian population's rate. This study is a follow-on to an earlier study, which collected publicly available social media data on military Service personnel who died by suicide and a control group. The purpose of this effort was to review the social media data again and identify themes that were not coded for in the original study. The findings from this study provide support for established risk and protective factors, and draw attention to third-party online interactions. Recommendations are offered for integrating social media data into suicide prevention efforts and for additional exploratory social media research.

Eric L. Lang, Ph.D.
Director, PERSEREC

EXECUTIVE SUMMARY

INTRODUCTION

The Defense Suicide Prevention Office (DSPO) funded the Defense Personnel and Security Research Center (PERSEREC), a division within the Defense Manpower Data Center (DMDC), to conduct research on social networking posts made by military Service personnel who died by suicide. In the first phase of this project, PERSEREC collaborated with the National Center for Veteran's Studies (NCVS) to examine whether military Service personnel posted indicators of suicide on their social networking accounts. That phase of the study focused on postings that included indicators identified by the fluid vulnerability theory. As a follow-on to this work, the second phase examines the information that subjects posted online through a qualitative content analysis to identify common themes not included in the Phase 1 analysis.

METHODOLOGY

This is a retrospective study based on a random sample of 700 military Service personnel who died by suicide between January 1, 2010 and December 31, 2011, and a demographically matched control group of 700 military Service personnel who died by means other than suicide during the same timeframe. The sample was drawn from 2010 and 2011 Suicide Data Repository (SDR).

The analysis used social media data collected for *Indicators of Suicide Found on Social Networks: Phase 1* and focused on social media data that were not coded as part of Phase 1 to identify emerging themes.

FINDINGS

An exploratory analysis using qualitative content coding was conducted to identify themes relevant to suicide risk and prevention within those social media data. This analysis was limited to subjects with (1) social media profiles and (2) publicly available social media posts and account activity (n=315). One hundred and fifty-eight subjects (50.2%) were from the suicide group and 157 subjects (49.8%) were from the non-suicide group. Clinical indicators coded by NCVS were not used in this analysis. The content analysis produced 10 themes and 27 sub-themes, some of which align with known protective and risk factors. The 10 themes include:

- Sense of meaning or purpose
- Positive online interactions
- Real world connections
- Optimistic outlook on life
- Negative employment
- Emotional distress
- Self-help
- Implied suicide
- Personal gun
- Concerned third-party posts

INTRODUCTION

DISCUSSION

This study found evidence supporting established risk and protective factors, including positive family interactions, having children, engaging in sporting activities, animal companionship, gratitude, access to lethal means, and employment issues. An unexpected finding is third parties (i.e., online friends) continue to post on subjects' social networking profiles after their deaths. Social networking platforms appear to be a tool used for bereavement. It is not clear from this effort whether this is a psychologically healthy approach to grieving but this practice may be worthy of additional research. Recognizing that social media user behaviors evolve and new social media platforms emerge over short periods of time, it will be important to continue studying this field of communication for user cues related to overall mental health wellness.

RECOMMENDATIONS

Recommendations for Suicide Prevention and Intervention

- (1) Develop training and education materials based on the findings from this effort, as well as the initial study, to increase awareness among military Service personnel that their colleagues may provide signals on Facebook and other social networking sites indicating a trajectory towards death by suicide.
- (2) Develop training and education materials designed specifically for commanding officers that address appropriate online interactions with military Service personnel who may be at risk of suicide.

Recommendations for Social Media Research

- (3) Obtain deployment data from the *Contingency Tracking System Overseas Contingency Operations Deployment File* to identify subjects in this study's sample who were deployed overseas, and reassess their social media data to identify suicide risk and protective factors that emerged during periods of deployment. Findings from a study like this could be used to customize suicide education, awareness, and training materials used during deployment.
- (4) Conduct additional research exploring the extent to which subjects in this sample posted any images or text about firearms, for the purpose of providing evidence to support a DoD-wide means restriction policy.
- (5) Conduct research into online mourning practices to determine if this environment offers grieving individuals a healthy alternative or addition to traditional customs of bereavement. Findings could help identify and develop postvention strategies.

TABLE OF CONTENTS

INTRODUCTION	1
BACKGROUND	1
METHODOLOGY	3
SAMPLE	3
CODING AND ANALYSIS	5
FINDINGS	7
PREDOMINANT THEMES AND SUB-THEMES IDENTIFIED IN THE SOCIAL MEDIA DATA OF THE NON-SUICIDE GROUP	7
PREDOMINANT THEMES AND SUB-THEMES IDENTIFIED IN THE SOCIAL MEDIA DATA OF THE SUICIDE GROUP	10
THIRD-PARTY POSTS	15
HARMFUL THIRD-PARTY POSTS	17
Postmortem Third-Party Posts	18
DISCUSSION	19
RISK FACTORS	19
PROTECTIVE FACTORS	20
THIRD-PARTY CONTENT	21
RECOMMENDATIONS	21
REFERENCES	23
APPENDIX A : TERM DEFINITIONS	A-1

LIST OF TABLES

Table 1 Demographic Characteristics for Subjects with Social Media Data (n=315)	4
Table 2 Military Status of Subjects with Social Media Data (n=315)	5
Table 3 Themes most Prevalent within the Non-suicide Group's Social Media Data	8
Table 4 Themes most Prevalent within the Non-suicide Group's Social Media Data: Number of Subjects by each Sub-theme	10
Table 5 Themes most Prevalent within the Suicide Group's Social Media Data	11
Table 6 Prevalent Themes within the Suicide Group's Social Media Data: Number of Subjects by each Sub-theme	14
Table 7 Implied Suicide	15
Table 8 Definitions of Concerned Third Party Posts	16
Table 9 Concerned Third Party Posts: Number of Subjects by each Sub-theme	17

INTRODUCTION

LIST OF FIGURES

Figure 1 Facebook Posts between a Subject in the Suicide Group and a Higher Ranking Officer_____	18
---	----

INTRODUCTION

In Fiscal Year 2014, the Defense Suicide Prevention Office (DSPO) funded the Defense Personnel and Security Research Center (PERSEREC), a division within the Defense Manpower Data Center (DMDC), to conduct research on social media posts made by military Service personnel who died by suicide.

PERSEREC collaborated with the National Center for Veteran's Studies (NCVS) to examine whether military Service personnel provide suicide risk indicators on their social networking accounts. This is a follow-up effort which further explores social media data associated with military Service personnel who died by suicide and who also died by other causes for the purposes of (1) identifying other relevant information found on social networks that was not coded for during the initial research, and (2) examining communication between subjects and third parties (i.e., online friends). Using a qualitative approach, the social media data from the first effort were reviewed and coded for recurring themes.

NOTE: Refer to APPENDIX A: Term Definitions for definitions of key terms used throughout this report.

BACKGROUND

During the earlier social media research, *Indicators of Intent to Die by Suicide: Part 1* (Hesse, Bryan, & Rose, 2015), PERSEREC randomly selected 700 military Service personnel who died by suicide in 2010 and 2011, and it also selected a demographically matched control group (n=700) made up of military Service members who died by causes other than suicide. The sample was drawn from the Veteran's Affairs (VA)/Department of Defense (DoD) Suicide Data Repository (SDR), a mortality database. Social media checks were conducted on these subjects. Only publicly available social networking posts, made within a year prior to subjects' deaths, were collected and coded. During Phase 1, Dr. Craig Bryan and his team at the National Center for Veteran's Studies (NCVS) coded the data.

The NCVS team coded for 36 clinical indicators of suicide and analyzed the data to determine if there were statistically significant relationships between cause of death and the indicators. The fluid vulnerability theory guided the coding and the indicators were categorized into five clusters:

- (1) *Triggers*: Stressful situations or life circumstances that could potentially activate an acute suicidal crisis.
- (2) *Cognitions or thoughts*: Beliefs, assumptions, and subjective appraisals of the self and/or a situation.
- (3) *Behaviors*: Descriptions of observable actions.
- (4) *Physical/physiological symptoms*: Somatic complaints or other health-related issues.

INTRODUCTION

(5) *Emotions*: Feelings or internal affective states or experiences.

The study found that subjects whose social networking profiles included more content coded for hopelessness and insomnia during the year prior to death were more likely to be in the suicide group and subjects with more content coded for sarcasm, physical problems/somatic symptoms, social withdrawal, and anxiety were less likely to be in the suicide group.

Additional analyses examined the impact of time and third-party posts on the predictive model. By restricting the scope of the analysis to 30 days prior to death, a new predictive model emerged.¹ A follow-on effort led by Dr. Craig Bryan is studying the relationship between the date of coded social media posts and date of death, and exploring the potential to develop an imminent warning model.

Third-party posts provided important contextual information. Often, these posts helped analysts better understand the true intent of statements, images, or video links posted by subjects. In some instances, the third-party provided relevant information about the stressors subjects faced (ex: *I know this divorce is hard on you, but I'm here for you. Call anytime*). The team at NCVS coded third-party posts for the 36 indicators of suicide but coders did not delineate if the coded information was about the subject, or if the post was about someone else. The purpose of this coding strategy was to capture stressors to which subjects were exposed, even if only indirectly. However, when the analysis was limited to posts made only by the subjects in the sample, yet another model emerged, suggesting the third-party coding strategy biased the model.^{2,3}

After NCVS coded and analyzed the social media data, PERSEREC reviewed the raw data and determined that there were important themes throughout the social media reports that were not captured in the initial coding scheme (e.g., type of images posted by subjects, seriousness of specific types of relationship problems, gun references, etc.). The social media reports were reviewed and coded a second time. This report describes the recoding and analysis.

¹ Five indicators were included in the 30-day model: Religious affiliation, interpersonal/relationship problems, thwarted belongingness, anger, and general distress

² Two variables were included in the 1-year model of just user-generated posts: Religious affiliation (a demographic variable) and wish for death/nonsuicidal morbid ideation (a coded indicator).

³ Three indicators were included in the 30-day model of just user-generated posts: Significant loss, alcohol use, and anger.

METHODOLOGY

The following section describes the study's sample, data collection methods, and methods used for analyzing the coded social media data.

SAMPLE

The subjects included in this effort were drawn from the SDR, a repository containing data from the National Death Index (NDI) and the Defense Casualty Analysis System (DCAS). The sample initially consisted of 1,400 military Service personnel, 700 who died by suicide and 700 who died from reasons other than suicide. Individuals from all Service Components, as well as the Reserves, National Guard, and Coast Guard, were included. For information on the initial sample, see the report *Indicators of Suicide Found on Social Networks* (Hesse, Bryan, and Rose; 2015).

This study only examined subjects with publicly available social media content (n=315). Subjects with social media accounts and implemented privacy settings were excluded as well.⁴ Subjects ranged in age from 17 to 59, with a median age of 24. Subjects were more often single, Caucasian, males with no dependents, and possessed a high school diploma. Subjects were also more often junior enlisted Service members serving in the Army.

Table 1 and Table 2 present the demographic characteristics of the subjects included in this study.

⁴ The use of privacy settings prevents people who are not users' friends or connections from viewing their social networking profile.

METHODOLOGY

Table 1
Demographic Characteristics for Subjects with Social Media Data (n=315)

Sample Characteristics	Non-suicide		Suicide	
	n	% of 158	n	% of 157
<i>Gender</i>				
• Male	127	80.4	130	82.8
• Female	31	19.6	27	17.2
<i>Marital Status</i>				
• Never married	93	59.2	86	54.8
• Married	49	31.2	63	40.1
• Divorced	12	7.6	8	5.1
• Widowed	1	0.6	0	0.0
• Unknown	2	1.3	0	0.0
<i>Dependents</i>				
• None	98	62.4	90	58.1
• 1	22	14.0	27	17.4
• 2	19	12.1	13	8.4
• 3	12	7.6	12	7.7
• 4 or more	6	3.8	13	8.4
• Unknown	1	0.6	2	1.3
<i>Race</i>				
• White	81	51.3	60	38.2
• Black or African American	10	6.3	4	2.5
• American Indian/Alaskan Native	2	1.3	4	2.5
• Asian	4	2.5	0	0.0
• Unknown	61	38.6	89	56.7
<i>Education</i>				
• High school (HS) diploma	117	74.1	122	77.7
• Associates or bachelor degree	21	13.3	17	10.8
• Some college but no HS diploma	11	7.0	8	5.1
• Less than HS	4	2.5	7	4.5
• Master degree	1	0.6	1	0.6
• Unknown	4	2.5	2	1.3
<i>Religious Affiliation</i>				
• Christian	97	61.4	85	54.1
• No religion	45	28.5	51	32.5
• Other	2	1.3	3	1.9
• Unknown	14	8.9	18	11.5

Table 2
Military Status of Subjects with Social Media Data (n=315)

	Non-Suicide		Suicide	
	n	% of 158	n	% of 157
<i>Component</i>				
• Regular	61	38.6	88	56.1
• Reserves	41	25.9	36	22.9
• Guard	56	35.4	33	21.0
<i>Service</i>				
• Army	93	58.9	89	56.7
• Air Force	20	12.7	27	17.2
• Navy	20	12.7	22	14.0
• Marine Corps	22	13.9	15	9.6
• Coast Guard	3	1.9	4	2.5
<i>Rank</i>				
• Junior enlisted	106	67.1	111	70.7
• NCO	35	22.2	34	21.7
• Officer	10	6.3	8	5.1
• Senior Enlisted	3	1.9	3	1.9
• Warrant Officer	4	2.5	1	0.6

CODING AND ANALYSIS

PERSEREC performed a qualitative content analysis to identify relevant information that was not captured in the previous study's coding scheme. Content analysis is a naturalistic examination, where coders review data without pre-defined coding categories (Cho, J. L., and Lee, E., 2014). It was also an iterative process, as previously coded data were reviewed again after a new category was identified.

Typically when performing a content analysis, a category should be mutually exclusive, meaning that data should only fall within one category. However, units of analysis are usually interview transcripts, survey responses, and field notes. Social media data are more different than almost every other kind of data. These data consist of unstructured text from both the subject of interest and third parties, videos, links, and images. Oftentimes, multiple themes emerge from a single social media post. Therefore, for this analysis, the data are not mutually exclusive. For example, if a subject were to post *I thank God every day for blessing me with an amazing and caring family*, and the post contains multiple themes (i.e., belief in a higher power, gratitude, and positive family interactions), it would be coded for each of these themes. Another example is an image of a subject standing in the woods, next to a dead deer and holding a gun. The image was coded for both

METHODOLOGY

“sporting activities,” and “personal gun,” which was defined as the ownership or possession of a non-military gun.⁵

Issues coded in the previous study were not coded in this qualitative content analysis; however, there may have been some overlap. For example, some of the issues coded by NCVS may have been identified at a more granular level during the content analysis. For example, NCVS coded for employment problems, whereas the content analysis identified negative statements about military and civilian employment.⁶

Another difference between the coding and analyses performed by NCVS and this effort was how issues and themes were counted. NCVS counted each instance an indicator appeared within a subject’s social media data. For example, within the NCVS coding scheme, a subject who posted five comments about drinking alcohol over the course of 1 year would have a total count of five alcohol statements. This approach to coding was essential for that effort because it identified issues that were persistent over time. The content analysis performed in this study did not look at frequency of a theme, instead it identified if a theme was present in the data. Because of the exploratory nature of the content analysis, emphasis was placed on identifying emerging themes and how they may relate to the literature on suicide. When all of the data were coded and categorized, they were then grouped into broader themes.

⁵ It was sometimes difficult to determine whether the subject in an image was the subject of interest. In many instances, subjects indicated that they were the person in the photo. When the subject of the photo was unknown, an attempt was made to match the subject’s gender and body shape to other images within the social media report where the subject is identified.

⁶ In instances where it was not clear if the subject was making a statement about civilian or military employment, researchers looked at the subject’s military component. If the subject was in the National Guard or Reserves, the statement was coded as civilian, and if the subject was in the Regular component, then the statement was coded as military.

FINDINGS

Ten predominant themes and multiple subthemes, identified in the following sections, emerged between the suicide and non-suicide groups.

PREDOMINANT THEMES AND SUB-THEMES IDENTIFIED IN THE SOCIAL MEDIA DATA OF THE NON-SUICIDE GROUP

Four themes were more prevalent among the non-suicide group than the suicide group: *(1) sense of meaning, (2) positive online interactions, (3) real world connections, and (4) optimistic outlook on life* (see Table 3 and Table 4). The following section describes these themes in detail, provides the number of subjects in the non-suicide and suicide groups with identified sub-themes, and provides examples of social media data coded for each particular sub-theme.

FINDINGS

Table 3
Themes most Prevalent within the Non-suicide Group's Social Media Data

Themes	Sub-themes	Definitions	Examples from Social Media Profiles
<i>Sense of Meaning or Purpose</i>	Striving for or achieving goals	Achieving some level of success, or working toward a goal	<i>I am up for promotion to 1st Sgt in the Military. This would be my goal.</i>
	Military Pride	Pride in serving in the United States military, or meaning or purpose in military operations	<i>Happy vets day to all fallen, past, & present soldiers, a special happy vets day to the ones I went overseas with.</i>
	Patriotism	Attachment or devotion to the United States	<i>I'm an UN-APOLOGETIC AMERICAN!! I pledge allegiance to the flag of the UNITED STATES OF AMERICA.</i>
<i>Positive Online Interactions</i>	Gratitude & well wishes	Celebratory or thankful expressions made by subjects	<i>Just putting out a healthy Hello and wishing you a wonderful day...yes YOU!</i>
	Love	An expression of love for another person or, a third party expresses love to the subject	<i>I love you babe...you're a blessing from the Gods my love</i>
	Missing others; Missed by others	A positive and healthy desire to be near another person, or a third party expresses this desire to the subject	Facebook friend posts <i>I miss you sister!!</i> , and the subject responds <i>I miss you too</i>
<i>Real World Connections</i>	Sports/outdoor activities	Subjects engage in individual and organized sporting or outdoor activities	<i>Won a softball game tonite! I was sitting in for the other team since they were short players. Still counts, right?</i>
	Children	Images/statements about kids or grandkids	Subject posted images of his new born child.
	Pets	Images or statements about a pet	Multiple pictures of subject's new kitten.
	Positive family interactions	Statements about seeing family, expressions of pride in family, or posted images of family ⁷	<i>I can't wait for next Friday... get to see all my favorite brothers my sis and my niece...</i>
	Faith	Expressions of belief in a higher power	<i>I'm working on my relationship with my father. My lord n savior Jesus Christ. I need and wanna be closer to him.</i>
<i>Optimistic Outlook on Life</i>	Happy	Declarations of happiness or an expression that the subject is delighted or pleased	<i>Great job! Loving life as well! Finally can buy the house...</i>
	Looking forward	Hopefulness or excitement about a future event ⁸	<i>13 days till Incubus! They put on a great show I can't wait</i>

⁷ This sub-theme could only be coded when there was a specific statement or image conveying a familial relationship. Excludes those categories that fall under *Positive Online Interactions* and excludes images of children or grandchildren because those images were coded under the sub-theme of *Children*.

⁸ Coding excluded posts stating "Looking forward to the weekend," unless subjects mentioned a specific event or activity that was occurring during that time frame.

Table 4 presents the number of subjects in the non-suicide and suicide groups with social media data coded for sub-themes that made up the broader themes found more often within the non-suicide group. Sub-themes are not mutually exclusive. For example, a subject may have been coded for *Military Pride* and *Striving for or Achieving Goals*, both of which align under the theme of *Sense of Meaning or Purpose*.

Some of the more striking differences between the two groups include *Military Pride*, *Sporting Activities*, and *pets*. Twice as many subjects in the non-suicide (n=46, 29.1%) group as the suicide group (n=23, 14.6%) posted content that indicated pride in the military. Forty-six subjects (29.1%) in the non-suicide group have evidence of engaging in sporting or outdoor activities on their social networking page, whereas only 21 subjects (13.4%) in the suicide group displayed this type of activity on their social networking page. Forty-one subjects in the non-suicide group (25.9%) and 15 subjects in the suicide group (9.6%) posted images or text indicating a positive relationship with a pet.⁹

This analysis also coded references to children and grandchildren. While an attempt was made to exclude references to nieces and nephews and other non-familial relationships, it is possible that these types of relationships were coded for in this effort because the image or text that was coded conveyed a strong and positive relationship with the child(ren). Within the non-suicide group, 41 subjects (25.9%) posted one or more images or text references about a child or children in their lives. Within the suicide group, 30 (19.1%) subjects posted content about a child or children in their lives.

⁹ Evidence of animal abuse was found in two social media reports. The first subject (in the suicide group) was accused by a third-party of shooting her dog. The second subject (in the non-suicide group) posted comments about shooting squirrels and birds that were in his yard.

FINDINGS

Table 4
Themes most Prevalent within the Non-suicide Group's Social Media Data: Number of Subjects by each Sub-theme

Major Theme	Sub-themes	Non-Suicide		Suicide	
		n	% of 158	n	% of 157
<i>Sense of Meaning or Purpose</i>	Striving for or achieving goals	33	20.9	31	19.7
	Military Pride	46	29.1	23	14.6
	Patriotism	5	3.2	2	1.3
<i>Positive Online Interactions</i>	Gratitude & well wishes	50	31.6	30	19.1
	Love	43	27.2	34	21.7
	Missed by others or missing someone	34	21.5	21	13.4
<i>Engaged or Connected</i>	Positive family interactions	47	29.7	34	21.7
	Sports/Outdoor activities	46	29.1	21	13.4
	Children	41	25.9	30	19.1
	Pets	41	25.9	15	9.6
	Faith	12	7.6	6	3.8
<i>Optimistic Outlook on Life</i>	Happy	19	12.0	10	6.4
	Looking forward	17	10.8	10	6.4

PREDOMINANT THEMES AND SUB-THEMES IDENTIFIED IN THE SOCIAL MEDIA DATA OF THE SUICIDE GROUP

Table 5 presents the definitions of the themes and sub-themes found most often within the suicide group. *Emotional Distress*, *Self-help*, *Implied Suicide*, *Personal Guns*, and *Negative Employment* are themes that are more prevalent among the suicide group (see Table 6).

Table 5
Themes most Prevalent within the Suicide Group's Social Media Data

Major Theme	Sub-themes	Definition	Examples from Social Media Profiles
<i>Emotional Distress</i>	Loss	Grieving the loss of family, friends, or pets	<i>Today is the saddest day of my entire life just lost another soldier of mine in Afghanistan to an ied...</i>
	Regret	Disappointment in one's prior actions. Ruefulness.	<i>So many things I've left to myself and unsaid</i>
	Divorce or extreme marital discord	Expressions of unhappiness with a partner or spouse; descriptions of legal issues with partner, spouse, or former significant other	<i>You know its sad when you ask your so called wife Should I really have to live with a guy who wants to f*ck my wife? And she can't even give a simple yes or no answer. For any normal couple that's usually never an issue. What really sucks is...who seems like the most important man in her life right now? SURE AS F*CK ISN'T ME.</i>
	Bipolarity	Posts indicating drastic changes in mood over a short period of time	<i>July 25, 2011 – August 23, 2011</i> <ul style="list-style-type: none"> - Ready to start boxing again. - It's good to know early on when you're wasting your time. Fooled me, kudos to you. - F*ck everybody and everything. - Better now but damn!! - On the edge and I'm ready to jump. - ... I'm about to let loose on everybody. - ... F@#k today, F@#k tomorrow, F@#k this... - By plucking petals, you do not gather the beauty of the flower. - They say when the student is ready to learn the teacher will appear. My teachers are here & I'm ready to learn. I screwed around last semester but I'm shutting down this semester. I'm ready to save lives, maybe even yours...
<i>Self-help</i>	Rebirth	Comments about starting over or "turning over a new leaf"	<i>The bad things that happen in life are like tornadoes. Devastating when they hit but they clear the path for new beginnings.</i>
	Reaching out to others	Expressions of needing support and/or strength from others, or needing to talk out problems with another person	<i>Needs a friend whom will be strong, that I can lean on and help me carry on...</i>

FINDINGS

Major Theme	Sub-themes	Definition	Examples from Social Media Profiles
	Reflective	Subjects post about behaviors that occurred in the past and wishes that they had taken a different path, or indicates that they have learned from the experience	<i>Today was...a wonderful day in my life of what others have tried to show me, but I was so selfish and never wanted to pay attention. So people open your eyes and take a look around you. You have no idea what is really going on till you start paying attention of your surroundings...</i>
	Positive affirmations	Expressions of positive thinking or mental attitudes in an attempt to achieve success or overcome challenges	<i>Sunny days wouldn't be special if it wasn't for rain; joy wouldn't feel so good if it wasn't for pain.</i>
<i>Implied Suicide</i>		Subjects' post about leaving, how they want to be remembered, or post a fantasy of engaging in suicidal behavior	On the date of death, the subject posted <i>I love you all. I'll miss you...Goodbye!</i>
<i>Personal Gun</i>	Images or text	A post that conveys ownership or possession of a non-work-related gun	Picture of a handgun with the statement <i>my baby.</i>
<i>Negative Employment</i>	Military	Feeling trapped in the military, dissatisfied with the work, or issues with members of the military unit	<i>2 years 10 months and 23 days... damn I can't wait...until I rid myself of the air force.</i>
	Civilian	Dislike of civilian job or co-workers, or unemployment	<i>I was just informed by [insert name] that the VFW is not going to have Karaoke anymore... it puts me out of a job but lets me spend more time with my Family, Thank you....Until Further notice...</i>

Table 6 presents the number of subjects in the non-suicide and suicide groups with social media data coded for sub-themes that made up the broader themes found more often within the suicide group. There are four sub-themes that were more frequently identified within the social media data of the non-suicide group. They are included in this section because these sub-themes comprise a larger theme that was predominately found within the suicide group. These sub-themes include: *Loss* (non-suicide =14, 8.9%; suicide n= 11, 7.0%), *Reflective* (non-suicide n=6, 3.8%; suicide n=5, 3.2%), and *Negative Civilian Employment* (non-suicide n=7, 4.4%; and suicide n=3, 1.9%).

Twice as many subjects in the suicide group (n=13; 8.3%) as compared to the non-suicide group (n = 6; 3.8%) expressed regret for something they did or did not do in the past. Almost five times as many subjects in the suicide group (n=14; 8.9%) as compared to the non-suicide group (n =3; 1.9%) posted statements indicating that they were experiencing significant marital problems, such as abandonment or adultery.

With respect to personal guns, images and text characterized by non-work related guns were found more often in the suicide group (n=23; 14.6%) than the non-suicide group (n=13; 8.2%). Of the 23 subjects who died by suicide and were coded for *Personal Guns*, 20 subjects died by discharge of firearms.¹⁰

Sub-themes *Bipolarity* (n=12, 7.6%) and *Rebirth* (n=16, 10.2%) were only found within the social media data of the suicide group. *Implied Suicide* was another sub-theme that was only found within the suicide group (n=10, 6.4%). Eight of these subjects posted statements indicating a departure or asking to be remembered within 24 hours of their death. One subject posted his statement 4 days prior to his death but it was the last post he made on Facebook, and one subject posted his goodbye message 5 weeks prior to his death. See Table 7 for a complete list of implied suicide postings.

¹⁰ Of the 157 subjects who died by suicide, 97 died by intentional self-harm by discharge of firearms, 49 died by intentional self-harm by hanging strangulation and suffocation, one person died by intentional self-harm by jumping from a high place, seven people died by intentional self-poisoning by and exposure to drugs and other biological substances, one person died by intentional self-poisoning by and exposure to other gases and vapors, and two people died by intentional self-harm by all other and unspecified means and their sequelae.

FINDINGS

Table 6
Prevalent Themes within the Suicide Group's Social Media Data: Number of Subjects by each Sub-theme

Major Theme	Sub-themes	Non-Suicide		Suicide	
		n	% of 158	n	% of 157
<i>Emotional Distress</i>	Loss	14	8.9	11	7.0
	Regret	6	3.8	13	8.3
	Divorce or marital discord	3	1.9	14	8.9
	Bipolarity	0	0.0	12	7.6
<i>Self-help</i>	Rebirth	0	0.0	16	10.2
	Reaching out to others	5	3.2	11	7.0
	Positive affirmations	9	5.7	9	5.7
	Reflective	6	3.8	5	3.2
<i>Implied Suicide</i>	Implied suicide	0	0.0	10	6.4
<i>Personal Guns</i>	Statements or images of non-work-related guns	13	8.2	23	14.6
<i>Negative Employment</i>	Military	20	12.7	27	17.2
	Civilian	7	4.4	3	1.9

Table 7
Implied Suicide

Age at Death	Gender	Number of Days between Date of Post and Date of Death	Post
22	Male	0	<i>I have gone looking for myself. I will return when I am found.</i>
22	Male	3	<i>Sometimes you gotta walk hard or go home.</i>
19	Male	1	<i>Please remember me. To everyone thank you and I love you all thank you.</i>
21	Male	0	<i>I wanna stay, but maybe I'll walk away. Let's make things interesting.</i>
25	Male	0	<i>So long.</i>
25	Female	0	<i>I love you all...ill miss you...goodbye!</i>
23	Male	1	<i>Goodbye everyone love u</i>
37	Male	0	<i>So here it is...The Doors sang about this is the end right? Well I am not nearly as influential or artistic as them, I have contributed nothing to the society as a whole, I have tried...now I am tired and sad good night Gracie!</i> <i>Hi there, Take care of each other, [Name redacted] I am sorry for leaving you all before</i>
26	Male	1	<i>Got to watch over my family, I love them. [Facebook friend is tagged in this post, implying this post was directed at that friend]</i>
29	Male	40	<i>asks why is everything I truly believe is real....always fake? Im thinking its the end..... Is so tired. I'm sorry it seriously came 2 this. Lived, loved, and lost. Lifes a bitch and then you die.</i>

THIRD-PARTY POSTS

Concerned third-party posts were equally apparent within the social media data belonging to subjects within the non-suicide and suicide groups. Table 8 provides the definitions of the sub-themes that make-up the broader theme *concerned third-party posts*.

FINDINGS

Table 8
Definitions of Concerned Third Party Posts

Major Theme	Sub-themes	Definition	Examples from Social Media Profiles
<i>Concerned Third Party Posts</i>	Concerned online friends	Online friends respond to subjects' despondent or hopeless posts by offering support (e.g., a shoulder to cry on, positive affirmations, etc.)	<i>Are you OK- I know it has been rough losing both parents. Remember you do have family that cares!</i>
	Urgent posts from friends	Online friends respond to subjects' posts that are despondent, hopeless, or may imply suicide by insisting that the subjects call them immediately, or online friends indicate that they are going to call the subjects immediately	In response to the following posts made by a subject, <i>Please remember me</i> and <i>To everyone thank you and I love you thank you</i> , Facebook friends posted: <ul style="list-style-type: none"> - ...please...we love you... just go back to the base. I am begging you! You can get out of the military if that's what you want. ... It is always hard in the beginning. Please we love you! <i>I don't know what's going on but please call me. I love you!</i>

Almost as many subjects in the non-suicide group (n= 18, 11.4%) as compared to the suicide group (n=17, 10.8%) had social media data with posts from concerned online friends. Only the suicide group had posts from friends that indicated an urgent concern for the subject (n=4, 2.5%). See Table 9. These urgent posts were always in response to a post that was coded as *implied suicide*, suggesting that these subjects had expressed suicidal ideation prior to the posting.

Table 9
Concerned Third Party Posts: Number of Subjects by each Sub-theme

Major Theme	Sub-theme	Non-Suicide		Suicide	
		n	% of 158	n	% of 157
Concerned Third Party Posts	Concerned online friends	18	11.4	17	10.8
	Urgent posts from online friends	0	0.0	4	2.5

HARMFUL THIRD-PARTY POSTS

It is important to note that in almost every instance where subjects posted content that revealed a personal sadness, despair, need for help, or some other life stressor, there was no evidence suggesting third parties engaged in cyberbullying. However, one subject in the suicide group was despondent because he had to send his dogs to a new home. The subject appeared to be exchanging posts with a Commanding Officer (CO), and while the CO initiated contact over concern for his online friend, the progression of the conversation appears to be an attempt at tough love with elements of shaming (see Figure 1).

FINDINGS

Subject: Been giving my dogs treats all night because I will never see them again after tomorrow. I love those dogs.

3rd Party: Why won't you ever see them again? [Name redacted], are you okay? I am worried about you!

Subject: No, I'm not okay. Sending the dogs to a new home...**Not suicidal**. But I am losing almost everything.

Subject: Well, everything I hold dear. My fault. Gonna be rough.

Subject: Thanks, [name redacted] I appreciate your concern. Sad that I have to get rid of my dogs.

3rd Party: What are you gaining? You will still have a loving wife [name redacted] albeit she won't be near, but you can stay close to her. The dogs will be happy if they are headed to a good home. Beats the pound. So you have given them a new home and someone to care for and about them. [Name redacted] you have to pick yourself up and move on. People count on you. [Name redacted] counts on you unconditionally!!! Snap to and drop and give me 50.

Subject: Thanks [officer rank redacted].

3rd Party: You want to see someone who is bad off? I will introduce you to a few folks I met this week....missing limbs, badly burned, and blind. Their lives are a challenge, but they are glad to be alive and are not feeling sorry for themselves. They feel sorry for their buds who died! Hit the control-alt-delete and reboot your outlook mister. Your parents didn't raise a pussy. Man up now for [name redacted].

Subject: A'ight Sir.

3rd Party: ☹ You have a lot of support. Hang in there Sir.

Figure 1 Facebook Posts between a Subject in the Suicide Group and a Higher Ranking Officer

Postmortem Third-Party Posts

Postmortem comments were not coded in this effort; however, researchers did notice the frequent presence of third-party posts dated after subjects' deaths. Postmortem posts were not always present in the social media reports because the scope of the social media data collection effort was 1 year prior to death. However, there were social media profiles that showed third-parties commenting on pictures or status updates that were originally posted during the data collection timeframe.

DISCUSSION

The primary purpose of this study was to determine if military Service personnel who died by suicide were posting information, in addition to clinical indicators of suicide, that could help inform suicide prevention efforts. The findings from this study suggest that social media data can provide relevant information about subjects' thoughts and activities in the days and months before their deaths.

RISK FACTORS

This study gained some insight on easy access to lethal means, specifically firearms (Barber & Miller, 2014; Agerbo, Gunnell, Bo Mortensen, & Nordentoft, 2007; Mann, Apter, Bertole, et al, 2005; Daigle, 2005). Findings showed almost twice as many subjects in the suicide group as compared to the non-suicide group posted content indicating access to a non-military firearm. Military personnel are especially vulnerable to this risk factor because of they have access to, and experience using weapons, particularly firearms (Nock, Deming, Fullerton, et al, 2013). However, access to lethal means is a modifiable risk factor, meaning the level of risk can be mitigated through intervention (U.S. Department of Health and Human Services, Agency for Healthcare Research and Quality, n.d.).

Means restriction is the reduction of access to means such as firearms, alcohol, and medicines for the purpose of reducing suicide, and it is one of the 11 goals of the Department of Health and Human Service's *National Strategy for Suicide Prevention*.¹¹ At this time, the military Services do not have means restriction policies in place for individuals who are at risk for dying by suicide but it is important for policy-makers to have conversations about how this approach might work within DoD. Furthermore, discussions will need to address whether such a policy would address personal or Service-related access to firearms, or both.

Combat exposure is an established risk factor (Bryan, Griffith, Pace, et al, 2015; Bryan, Cukrowicz, West, & Morrow, 2010) that could not be properly identified within the social media data without additional deployment data. While there were a number of images posted of what appears to be a combat zone, it was often impossible to be certain subjects were deployed. A follow-on study assessing social networking posts made by subjects who were deployed would create a more robust understanding of their behaviors and cognitions during deployment, possibly leading to the development or revision of health and wellness initiatives for deployed personnel.

In addition to risk factors, this study identified 10 subjects in the suicide group who posted statements implying that they were planning to die. Because this study had the benefit of hindsight we could identify these types of posts made within a

¹¹ National Strategy for Suicide Prevention Goal #6: Promote efforts to reduce access to lethal means among individuals with identified suicide risk.

DISCUSSION

few hours or days of death,¹² suggesting there may be an opportunity to intervene immediately after someone posts a “good-bye” or “remember me” message. However, intervention could be complicated. The potential for false positives exists because these types of messages are subjective and are less-likely to be interpreted as a suicide note at the time it is posted unless an individual was previously identified as at-risk of dying by suicide.

PROTECTIVE FACTORS

This study identified a number of themes and sub-themes related to protective factors, including positive family interactions, children, sporting activities, and animal companionship. Protective factors are conditions or characteristics that help people deal with stress in an effective manner. Previous research found that the level of life-satisfaction and self-esteem can minimize hopelessness, and suicidal ideation is minimized by perception of social support (Chioqueta, A. P. & Stiles, T. C., 2007). Perceptions of social support may include having children, spirituality, and engaging in organized sports (Chioqueta, A. P. & Stiles, T. C., 2007).

Furthermore, a regular physical fitness routine has been shown to reduce depression (Oertel-Knochel, Mehler, Thiel, et.al, 2014; Dinas, Koutedakis, & Flouris; 2011), a common mental disorder and a risk factor for suicide (American Foundation for Suicide Prevention, n.d.; National Institute of Mental Health, n.d.).

Additionally, previous efforts suggest that being a parent decreases one’s risk for suicide (Goldsmith, Pellmar, Kleinman, Bunney, 2002; Qin, Agerbo, & Mortenson, 2000; Fawcett, Schefner, Clark, et al., 1987). This analysis provides further support of this protective factor. However, the images and text present in social media data imply that this relationship alone may not sufficiently insulate one from risk of dying by suicide. Instead, quality of the parent-child bond, evidenced by level of involvement with children and their activities, likely contribute to the strength of this protective factor.

Another protective factor that emerged in this research is animal companionship. While this research could not be certain of pet ownership, three times as many subjects in the non-suicide group compared to the suicide group posted images or references to animals that are typically household pets. All images and references coded for pets had to intimate positive social interactions with animals.

Anecdotal evidence suggests animal companionship reduces stress and depression, and increases resilience (Strassberg, 2015). With respect to the military, Service personnel who began training service dogs found that they had an increase in patience, impulse control and emotional regulation, as well as decreased depression and an increase in positive sense of purpose (Yount, Olmert, & Lee, 2012). Empirical research is needed to explore the potential healing relationship between

¹² Implied suicide was only found on Facebook. This finding is likely related to popularity of the social networking site.

humans and animals, and approaches for integrating this relationship into a military setting should be explored.¹³

THIRD-PARTY CONTENT

It is important to note the impact of suicides on third parties. While the purpose of this study was to learn more about subjects who die by suicide through social media data, an unexpected finding was the use of social media by third parties to grieve and remember. A forthcoming report describing the development of a suicide risk algorithm using the same social media data used in this study, found that third parties continue to post on deceased subjects' Facebook pages (Jamalamadaka, Lurie, Whiteley, et. al, Unpublished Manuscript).

An examination of 193 Facebook profiles associated with this study's sample found 19,195 third-party wall posts prior to death and 86,447 third-party posts after death. Those who are affected by someone's suicide continue to publicly grieve on social networking sites. Perhaps Facebook's dynamic environment offers greater opportunity to mourn and share one's grief with others on a continuing basis, as compared to traditional methods like attending a memorial, wake or funeral; each usually occurring at only one point in time. It may also be that Facebook is convenient and physically private. One need not leave their home to express their emotions, thus preventing others from seeing the physical toll the loss has taken. These findings suggest that the integration of social media tools into postvention strategies may be an important pursuit.

RECOMMENDATIONS

Recommendations for Suicide Prevention and Intervention

- (1) Develop training and education materials based on the findings from this effort, as well as the initial study, to increase awareness among military Service personnel that colleagues may provide signals on Facebook and other social networking sites indicating a trajectory towards death by suicide.
- (2) Develop training and education materials designed specifically for commanding officers that address appropriate online interactions with military Service personnel who may be at risk of suicide.

Recommendations for Social Media Research

- (3) Obtain deployment data from the Contingency Tracking System Overseas Contingency Operations Deployment File to identify subjects in this study's

¹³ The United States Army allows for the integration service animals into the military work environment; however the presence of a service animal is at the discretion of an installation's senior commander (Army Directive 2013-01, Guidance on the Acquisition and Use of Service Dogs by Soldiers).

DISCUSSION

sample who were deployed overseas, and reassess their social media data to identify suicide risk and protective factors that emerged during periods of deployment. Findings from a study like this could be used to customize suicide education, awareness, and training materials used during deployment.

- (4) Conduct additional research exploring the extent to which subjects in this sample posted any images or text about firearms, for the purpose of providing evidence to support a DoD-wide means restriction policy.
- (5) Conduct research into online mourning practices to determine if this environment offers grieving individuals a healthy alternative to traditional customs of bereavement. Findings could help identify and develop postvention strategies.

REFERENCES

- American Foundation for Suicide Prevention, (n.d.). *Suicide Risk Factors*. Retrieved from <http://www.afsp.org/understanding-suicide/suicide-risk-factors>
- Army Directive 2013-01: Guidance on the Acquisition and Use of Service Dogs by Soldiers.
- Barber, C. W. & Miller, M. J. (2014). Reducing a suicidal person's access to lethal means of suicide: A research agenda. *American Journal of Preventative Medicine*. 47(3), pp 264-272.
- Bryan, C. J., Cukrowicz, K. C., West, C. L., & Morrow, C.E. (2010). Combat experience and the acquired capability for suicide. *Journal of Clinical Psychology*. 66(10), pp1044-1056.
- Bryan, C. J., Griffith, J. H., Pace, B. T., Hinkson, K., Bryan, A. O., Clemans, T. A., Imel, Z. E. (2015). Combat exposure and risk for suicidal thoughts and behaviors among military personnel and veterans: A systematic review and meta-analysis. *Suicide and Life-threatening Behavior*. Retrieved from [http://onlinelibrary.wiley.com/journal/10.1111/\(ISSN\)1943-278X/earlyview](http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1943-278X/earlyview)
- Bryan, C. J., Hernandez, A.M., Allison, S., and Clemans, T. (2013). Combat exposure and suicide risk in two samples of military personnel. *Journal of Clinical Psychology*. 69(1), pp 64-77.
- Chioqueta, A. P. & Stiles, T. C. (2007). Cognitive Factors, Engagement in Sport and Suicide Risk. *Archives of Suicide Research*. 11(4), pp375-390.
- Chioqueta, A. P. & Stiles, T. C. (2007). The relationship between psychological buffers, hopelessness, and suicidal ideation: Identification of protective factors. *The Journal of Crisis Intervention*. 28(2), pp 67-73.
- Cho, J. Y. & Lee, E. (2014). Reducing confusion about Grounded Theory and Qualitative Content Analysis: Similarities and differences. *The Qualitative Report*. Vol. 19(64), pp 1-20.
- Daigle, MS. Suicide prevention through means restriction: Assessing the risk of substitution. A critical review and synthesis. (2005). *Accident Analysis and Prevention*. 37: pp 625-632.
- Dinas, Koutedakis, & Flouris (2011).
- Fawcett, J., Schefner, W. A., Clark, D.C., Hedeker, D., Gibbons, R.D., Coryell, W. (1987). Clinical predictors of suicide in patients with major affective disorders: a controlled prospective study. *American Journal of Psychiatry*. 44, pp 35-40.

REFERENCES

- Goldsmith, S. K., Pellmar, T. C., Kleinman, A. M., Bunney, W. E. (2002). *Reducing suicide: A national imperative*. Institute of Medicine.
- Hesse, C. M., Bryan, C. J. & Rose, A. E. (In Press). *Indicators of Suicide Found on Social Networks: Phase 1*. Monterey, CA: Defense Personnel and Security Research Center/Defense Manpower Data Center.
- Jamalamadaka, A., Lurie, A., Whiteley, P., Hesse, C.M., and Rose, A. E. (In Press). *Automated prediction of suicide risk through social media and publicly available online data*. Monterey, CA: Defense Personnel and Security Research Center/Defense Manpower Data Center.
- Mann, JJ, Apter, A, Bertolote, JI, Beautrais, A., Currier, D., Haass, A., Hergerl, U., Longgqvist, J., Malone, K., Marusic, L., Patton, G., Phillips, M., Rutz, W., Rihmer, Z., Schmidtke, A., Shaffer, D., Silverman, M., Takahashi, Y., Varnik, A., Wasserman, D., Yip, P., & Hendin, H. (2005). Suicide prevention strategies: a systematic review. *Journal of the American Medical Association*. 2005; **294**: 2064–2074
- National Institute of Mental Health, (n.d.). What is Depression? Retrieved from <http://www.nimh.nih.gov/health/topics/depression/index.shtml>
- Nock, M. K., Deming, C. A., Fullerton, C. S., Gilman, S. E., Goldenberg, M., Kessler, R. C., McCarroll, J. E., McLaughlin, K. A., Peterson, C., Schoenbaum, M., Stanley, B., & Ursano, R. J. (2014). Suicide among soldiers: A review of psychosocial risk and protective factors. *Psychiatry*. (76)2: pp 97-125.
- Oertel-Knochel, Mehler, Thiel, Steinbrecher, Malchow, Tesky, Ademmer, Prvulovic, Banzer, Zopf, Schmitt, & Hansel (2014).
- Qin P, Agerbo E, Mortensen PB. (2003). Suicide risk in relation to socioeconomic, demographic, psychiatric, and familial factors: a national register-based study of all suicides in Denmark, 1981–1997. *American Journal of Psychiatry* 160(4): 765–72.
- Rudd, M.D. (2006). *Fluid vulnerability theory: a cognitive approach to understanding the process of acute and chronic risk*. In T. E. Ellis (Ed.), *Cognition and Suicide: Theory, Research, and Therapy* (pp. 355-368). Washington, DC: American Psychological Association.
- Strassberg, A. (2015). Guest opinion: keep calm and parent on; what can parents do right now to decrease the risk of suicide in their children? *Palo Alto Online*. Retrieved from <http://www.paloaltoonline.com/news/2015/03/16/guest-opinion-keep-calm-and-parent-on>
- U.S. Department of Health and Human Services (HHS) Office of the Surgeon General and National Action Alliance for Suicide Prevention. (2012). *National*

REFERENCES

- Strategy for Suicide Prevention: Goals and Objectives for Action*. Washington, DC: HHS, September 2012.
- Yount, R. A., Olmert, M. D., & Lee, M. R. (2012). Service dog training program for treatment of posttraumatic stress in service members. *The United States Army Medical Department Journal*. pp. 63-39.

**APPENDIX A:
TERM DEFINITIONS**

APPENDIX A

- Blogs: An abbreviation of “Web log,” blogs are websites with dated items of content in reverse chronological order, self-published by an individual. Posts are typically about a particular subject, are usually available as feeds, and often allow commenting.
- Content: Text, pictures, video, and any other meaningful material that is on the Internet.
- Curation: Collecting, filtering, reviewing, and sometimes providing commentary on articles, images, and videos. Curation does not include creating new content on social media.
- Facebook: A social networking website. Users can create a personal profile, add other users as friends, and exchange messages and profile updates.
- Facebook Wall: an area on one’s Facebook profile where Facebook friends can posts messages, pictures, videos, or links to other web pages.
- “Friend:” Another social media user whom an individual connects with and allows to view their profile. Users must request to be someone’s friend and then must be accepted by the user.
- Google+: A social networking service operated by Google Inc. The service launched on June 28, 2011 in an invite-only “field testing” phase.
- Microblog: Social media site, such as Twitter, that allows users to share small elements of information such as short sentences, individual images, video and website links.
- MySpace: A social networking website with an emphasis on music.
- News Feed: A feature of users’ Facebook accounts. It provides constant updates of the people and pages followed on Facebook; can include status updates, photos, videos, links, and app activity.
- Post: Content published on a social networking page or profile. May include text, video, images, or links to other web pages.
- Privacy Settings: Options offered by each social media platform to allow users control who can and cannot see their profile.
- Profiles: Information that users provide about themselves when signing up for a social networking site as well as a picture and basic information. This may include personal and business interests, a “blurb” and tags to help people search for like-minded people.
- Social Media: Tools and platforms people use to publish, converse, and share content online.
- Social Media Data: Online content that is created and/or curated by users. May include text, videos, images, or links to web pages.
- Social media report: A document that contains all publicly available, de-identified social media data collected by the data provider.

APPENDIX A

- Social Networks: An online service, platform or site that focuses on facilitating the building of relationships between people who might share interests, activities, backgrounds, or real-life connections.
- Status Update: a feature allowing users to share a short, text-based message with online friends.
- Subject-generated posts: Social media content created by the subjects in this study's sample
- Twitter: A platform that allows users to share 140-character-long messages publicly. Users can “follow” each other as a way of subscribing to one another's messages. Additionally, users can use the @username command to direct a message towards another Twitter user.
- Tumblr: A microblogging platform that allows users to post text, photos, videos, links, quotes, and audio to their tumblelog, a short-form blog.